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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/757,021	01/14/2004	Soovo Sen	AMAT/8758/DSM/BCVD/JW	3282

44257 7590 05/16/2007

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ART UNIT	**PAPER NUMBER**
1763	
MAIL DATE	**DELIVERY MODE**
05/16/2007	PAPER

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/757,021
Filing Date: January 14, 2004
Appellant(s): SEN ET AL.

Keith M. Tackett
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed January 8, 2007 appealing from the Office action mailed August 9, 2006.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows:

2. Whether claims 11, 12, 20, and 21 are unpatentable under 35 U.S.C. § 103(a) over US Patent 6,527,865 B1 to *Sajoto et al.* in view of WO 01/46498 A3 to *Frijlink* as applied to claims 1-5, ~~and~~ 8-10, and 16-18 above, and further in view of US Patent 6,666,920 B1 to *Sillmon et al.*

3. Whether claims 13-15 and 19 are unpatentable under 35 U.S.C. § 103(a) over US Patent 6,527,865 B1 to *Sajoto et al.* in view of WO 01/46498 A3

to *Frijlink* as applied to claims 1-5, ~~and~~ 8-10, and 16-18 above, and further in view US Patent 5,911,834 to *Fairbairn et al.*

4. Whether claim 22 is unpatentable under 35 U.S.C. § 103(a) over US Patent 6,527,865 B1 to *Sajoto et al.* in view of WO 01/46498 A3 to *Frijlink* and US Patent 5,911,834 to *Fairbairn et al.* as applied to claims 1-5, 8-10, ~~13-15,~~ and 13-19 above and further in view of US Patent 6,666,920 B1 to *Sillmon et al.*

These changes have been made to clarify the record. The rejections were incorrectly noted in the Final Rejection. The Applicant faithfully stated the rejections as found in the Final Rejection.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,527,865 B1	Sajoto et al	3-2003
WO 01/46498 A2	Frijlink	6-2001
6,666,920 B1	Sillmon et al	12-2003
5,911,834	Fairbairn et al	6-1999

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

3. Claims 1-5, 8-10, and 16-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sajoto et al, US Patent 6,527,865 B1, in view of Frijlink, WO 01/46498 A3.

Sajoto et al teaches a processing apparatus that includes a chamber body defining an interior processing region 20, a U-shaped (C-shaped) passage defining a pumping channel connected to a vacuum pump, a middle liner 28 including parts that partially line the U-shaped (C-shaped) passage, a lower liner 21, and a gas distribution plate 26. Sajoto et al also teaches the use of a Teflon™ O-ring seal (polymer). (Figure 2, and column 5 lines 41-46) The Examiner notes that the U-shaped passage and the C-shaped passage are the same shape. Both are annular and have a top, bottom, and radially outer sidewalls with an opening on the inner sidewall to make the C or U shape.

Sajoto et al differs from the present invention in that Sajoto does not teach a pumping liner; or a C-channel liner comprising: a circumferential body portion, a

circumferential upper arm, a lower arm, a channel portion defined by the upper arm, the lower arm, the body of the C-channel liner, and the body of the pumping liner an upper lip circumferentially disposed along the upper arm, the upper lip of the C-channel liner configured to interlock with the shoulder of the pumping liner body, and a lower shoulder along a radial portion of the lower arm, the lower shoulder of the C-channel liner configured to interlock with the lower lip of the pumping liner.

Frijlink teaches a process kit that includes: a pumping liner configured to be placed within the processing region of the processing chamber, the pumping liner comprising: a circumferential body 18, wherein the circumferential body has a plurality of pumping holes 12 disposed along the circumferential body, a shoulder circumferentially placed along an upper surface of the pumping liner body, and a lower lip disposed along a radial portion of a lower surface of the pumping liner body; a C-channel liner configured to be placed along an outer diameter of the pumping liner body within the processing region of the processing chamber, the C- channel liner comprising: a circumferential body 17, an upper arm 15, a lower arm 14, a channel portion defined by the upper arm, the lower arm, the body of the C-channel liner, and the body of the pumping liner, an upper lip circumferentially disposed along the upper arm, the upper lip of the C-channel liner configured to interlock with the shoulder of the pumping liner body, and a lower shoulder along a radial portion of the lower arm, the lower shoulder of the C-channel liner configured to interlock with the lower lip of the pumping liner and to also provide a pumping port liner opening; and a pumping port liner 29A in communication with the pumping port liner opening of the C-channel liner.

(Entire document, specifically, page 5 lines 16-32 and figure 5a)

The motivation for replacing the parts of the liner 28 of Sajoto et al in the U-shape (C-shaped) passage with the processing kit of Frijlink is to: completely line the U-shaped (C-shaped) passage of Sajoto et al to prevent deposition of bi-products on exposed surfaces of the gas manifold 46 or support ring 78 of Sajoto et al; simplify the construction of the middle shield ring and thus reduce the cost of the apparatus; and most importantly, improve the uniformity of the gas flow in the processing chamber by equalizing the pressure gradient by replacing the open pumping channel of Sajoto et al with the pumping liner with holes 12 of Frijlink.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to use the pumping kit of Frijlink in the apparatus of Sajoto et al.

4. Claims 11, 12, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sajoto et al and Frijlink as applied to claims 1-5, 8-10, and 16-18 above, and further in view of Sillmon et al, US Patent 6,666,920 B1.

Sajoto et al and Frijlink differ from the present invention in that they do not teach sealing the interface of the C-channel liner and pumping plate.

Sillmon et al teaches sealing the interface of a C-channel liner and a pumping plate. (Entire document)

The motivation for sealing the interface of the C-channel liner and pumping plate of Sajoto et al and Frijlink is to provide a gastight seal as taught by Sillmon et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to seal the interface of the C-channel liner and pumping plate of

Sajoto et al and Frijlink as taught by Sillmon et al.

5. Claims 13-15, and 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sajoto et al and Frijlink as applied to claims 1-5, 8-10, and 16-18 above, and further in view Fairbairn et al, US Patent 5,911,834.

Sajoto et al and Frijlink differ from the present invention in that they do not teach a pair of processing regions connected by a polished aluminum pressure equalization port liner.

Fairbairn et al teaches a processing apparatus that includes a pair of processing regions 106 connected by a polished aluminum pressure equalization port liner 621. (Figures 19, and 21)

The motivation for adding a second processing region to the apparatus of Sajoto et al and Frijlink is to increase the throughput of Sajoto et al and Frijlink as taught by Fairbairn et al. Furthermore, it has been held in *In re Harza* (124 USPQ 378) that the duplication of parts is obvious. (See MPEP 2144)

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to add a second processing region to the apparatus of Sajoto et al and Frijlink as taught by Fairbairn et al.

6. Claim 22 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sajoto et al, Frijlink, and Fairbairn et al as applied to claims 1-5, 8-10, and 13-19 above, and further in view of Sillmon et al, US Patent 6,666,920 B1.

Sajoto et al, Frijlink and Fairbairn et al differ from the present invention in that they do not teach sealing the interface of the C-channel liner and pumping plate.

Sillmon et al teaches sealing the interface of a C-channel liner and a pumping plate. (Entire document)

The motivation for sealing the interface of the C-channel liner and pumping plate of Sajoto et al, Frijlink and Fairbairn et al is to provide a gastight seal as taught by Sillmon et al.

Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to seal the interface of the C-channel liner and pumping plate of Sajoto et al, Frijlink and Fairbairn et al as taught by Sillmon et al.

(10) Response to Argument

In regard to the argument that:

> In contradiction to the Examiner's suggested motivation, Sajoto et al. already effectively lines the chamber with a liner 28. The liner 28 covers upper chamber surfaces (col. 8, l. 51-52). Changing the liner 28 to a process kit as suggested by the Examiner is mere speculation based upon hindsight. There is no indication of any problem of the liner 28 in Sajoto et al. necessitating a change in the liner.

The Examiner disagrees. Sajoto et al teaches in column 8 lines 45-54 that:

> Referring again to FIG. 2, removable deposition chamber liners (which can be used at a number of different locations) facilitate periodic cleaning of the deposition chamber. A liner in accordance with a preferred embodiment of the invention includes an integral or functionally integral (i.e., assembled from one or more components as attached or overlapping units) generally chamber liner 28 that covers upper chamber surfaces adjacent the substrate support member 24 and a bottom liner 21 covers the lower chamber wall surfaces below substrate support member.

First, Sajoto et al teaches that it is desirable to use liners to facilitate periodic cleaning of the deposition chamber, and second that chamber liner 28 generally covers upper chamber surfaces adjacent the substrate support member. Thus, Sajoto et al teaches it

is desirable to cover exposed portions of the chamber to facilitate cleaning of the chamber, and that chamber liner 28 generally covers upper chamber surfaces adjacent the substrate support member (not the exhaust conduit). Further, referring to figure 2 it can clearly be seen that chamber liner 28 does not shield the entire exhaust conduit and that there are exposed surfaces of the gas manifold 46 and support ring 78 that could be covered, and if covered would facilitate the cleaning of the processing chamber as taught by Sajoto et al. One of ordinary skill in the art seeking an exhaust conduit with a liner to cover all of the exposed surfaces of the exhaust conduit of Sajoto et al as suggested by Sajoto et al would be drawn to the process kit of Frijlink, which includes a liner for lining the exhaust conduit. Therefore, the combined teachings of Sajoto et al and Frijlink provide motivation for adding the process kit of Frijlink in the apparatus of Sajoto et al to prevent deposition on the gas manifold 46 and support ring 78 of Sajoto et al and to facilitate the cleaning of the chamber.

In regard to the argument that:

> Additionally, there is no suggestion in Frijlink to use the process kit in Sajoto et al. to provide any additional benefit. The process kit of Frijlink has an annular top part 15 that forms a portion of a gas-collector (col. 5, l. 16-19). There is no indication that the top part 15 is used to shield any portions of the apparatus of Frijlink. As may be seen from Figure 3 of Frijlink, the process kit does not shield anything because significant portions of the chamber remain uncovered (i.e., items 10, 20, 21, and 19C) by the process kit. Thus, taking a gas collector or a portion thereof and placing it into another apparatus for the purpose of preventing "deposition of bi-products on exposed surfaces of the gas manifold 46 or support ring 78" may only be accomplished with hindsight reasoning.

The Examiner disagrees. Without the process kit of Frijlink the exhaust conduit of Frijlink would be defined by the cover plate 20 outer ring 10 and base plate 30. All of which would be exposed to and coated directly by the bi-products of the process. The

gas-collector process kit of Frijlink shields all the parts radially outward of the gas-collector and at a minimum prevents direct deposition on the parts radially outward of the gas-collector. The addition of the inert gas flow from radially outward of the gas-collector prevents indirect deposition on the parts radially outward from the gas-collector. Thus, Frijlink clearly teaches preventing deposition on portions of the exhaust conduit. Second, the statement "As may be seen from Figure 3 of Frijlink, the process kit does not shield anything because significant portions of the chamber remain uncovered (i.e., items 10, 20, 21, and 19C) by the process kit" is false, because the part shielded is not described or limited by the part not shielded. At an absolute minimum, the gas-collector of Frijlink shields the part of the base plate 30 on which it rests. Therefore, the statement is false.

In regard to arguments:

> Removing a portion of the liner 28 of Sajoto et al. and replacing it with a process kit from Frijlink does not "simplify the construction of the middle shield ring and thus reduce the cost of the apparatus" as the Examiner has stated. Making a single liner 28 into multiple pieces (i.e., a portion of liner 28 and the process kit of Frijlink) creates a much more complicated design as multiple pieces would be necessary to perform the function obtained by a single liner 28. Reducing cost, as the Examiner has stated, is mere speculation without any evidential support.
>
> Similarly, adding a process kit from Frijlink to the liner 28 of Sajoto et al. also does not "simplify the construction of the middle shield ring and thus reduce the cost of the apparatus" as the Examiner has stated. Adding a process kit to an apparatus that already contains a liner 28 creates a much more complicated design as multiple pieces would be necessary to perform the function obtained by a single liner 28. Reducing cost, as the Examiner has stated, is mere speculation without any evidential support.

The Examiner disagrees. It is true that replacing the single piece liner 28 of Sajoto et al with a liner having multiple pieces does make for a "more complicated design",

however, it does not follow that the "more complicated design" is harder to construct or costs more than the single piece liner. This can clearly be seen in the manufacturing of the single liner 28 of Sajoto et al. The single liner 28 has a complex geometric shape that includes two cylinders having different radii connected by a disk. This complex geometric shape requires a complex molding (for ceramic members) followed by a complex machining of the single piece to finish the piece after the molding, or machining a solid block of metal (for metallic members), which is very complicated and expensive. On the other hand, it is much simpler to make the liner 28 out of multiple pieces (i.e. 2 cylinders and a disk), which are easily molded and/or machined. Thus, by making the single liner 28 out of multiple pieces, the construction process is simplified and the cost is reduced. Sajoto et al also teaches that the liner 28 can be made from a single piece (i.e. "integral") or from multiple pieces (i.e. "functionally integral (i.e., assembled from one or more components as attached or overlapping units)). Further, the addition of the top arm 15 and the pumping liner 18 of Frijlink does not significantly increase the complexity of construction or cost because they are also simple geometric parts (i.e. a cylinder and ring). Thus, one of ordinary skill in the art would recognize that it would be easier and cheaper to manufacture the liner 28 from multiple simple geometric shapes even with the additional simple geometric pieces from the process kit of Frijlink than by making the liner a single piece with a complex geometric shape.

In regard to the argument:

> The process kit of Frijlink would not equalize the pressure gradient of Sajoto et al. There is no indication that a pressure gradient problem exists in Sajoto et al.

The Examiner disagrees. Pumping channels formed in a U-shaped passage are well known in the art to have an asymmetric gas flow problem. This is caused by the fact that the gas entering the pumping channel in the U-shaped passage nearer the gas pumping port (i.e. the location where the vacuum pump connects to the U-shaped passage) is subject to a higher pressure gradient than the gas entering the pumping channel formed in the U-shaped passage located further from the gas pumping port. Thus, the gas leaving the processing region 20 of Sajoto et al into the pumping channel in the U-shaped passage nearer the gas pumping port flows faster than the gas entering the pumping channel in the U-shaped passage further from the gas pumping port resulting in an asymmetric flow and asymmetric processing of the substrate. This problem has been solved by adding a pumping liner which restricts the flow of gas from the processing region into the pumping channel in the U-shaped passage, and causes each aperture 12 to have the same pressure gradient regardless of its location from the gas pumping port. Therefore, the addition of a pumping liner improves the uniformity of the gas flow across the substrate and out of the processing region as is well known in the art.

In regard to the argument:

> The liner 28 in Sajoto et al. within the apparatus creates a "generally U-shaped passage surrounding the gas distribution assembly" that "forms a pumping channel through which gases are drawn into the exhaust system" (col. 5, l. 4-6). Adding the process kit of Frijlink to the apparatus of Sajoto et al. would likely disrupt the pumping of gases into the exhaust system because the process kit, as suggested by the Examiner, would need to be placed within the U-shaped passage of Sajoto et al. and thus clog the pumping channel.

The Examiner disagrees. First, the U-shape passage of Sajoto et al is formed in the chamber body 12 (see figures 1 and 2 and column 5 lines 1-6) and not by the liner 28. In fact, the upper parts of liner 28 are in the U-shaped passage. Therefore, replacing the upper parts of liner 28 in the U-shaped passage with the process kit of Frijlink would not disrupt or clog the pumping channel as argued because the parts of liner 28 in the U-shaped passage, as taught by Sajoto et al, are already in the U-shaped channel and do not disrupt or clog the pumping channel formed by the U-shaped passage. Furthermore, the combination of liner 28 of Sajoto et al and the process kit of Frijlink would only add one additional part to the pumping channel, specifically, an upper arm or annular top part 15. The remaining parts of the channel liner of Frijlink (i.e. the circumferential body 17, and lower arm 14) are equivalent to the upper parts of the liner 28 and would not reduce the volume of the U-shaped passage or the pumping channel as taught by Sajoto et al. The pumping liner is not part of the U-shaped passage and as such would not disrupt or clog the U-shaped passage or pumping channel. Second, assuming for the sake of argument, that the addition of the process kit of Frijlink did disrupt or clog the pumping channel. It would be obvious to then optimize the size of the pumping channel such that the gas was exhausted properly. Such an adjustment is well within the skill of one of ordinary skill in the art and would be part of the routine experimentation needed to optimize the gas flow in the processing chamber.

In regard to the arguments that claims 11, 12, 20, and 21 are not obvious over Sajoto et al in view of Frijlink and Sillmon et al; claims 13-15 and 19 are not obvious over Sajoto et al. in view of Frijlink and Fairbairn et al; and claim 22 is not obvious over

Sajoto et al. in view of Frijlink, Fairbairn et al., and Sillmon et al. The Examiner disagrees. These arguments are based on the arguments directed to Sajoto et al and Frijlink and are discussed above.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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PRIMARY EXAMINER

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